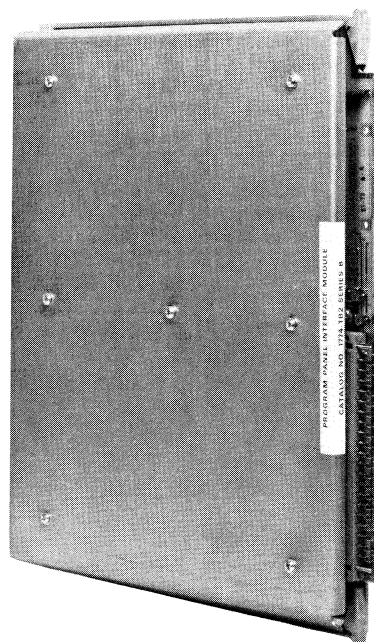


PROGRAM PANEL INTERFACE MODULE

Cat. No. 1774-TB2, (Series B)



1.0 Introduction — The **Series B** Program Panel Interface Module (Cat. No. 1774-TB2) is an optional Processor Module which allows communication between the PLC Processor and any one of the following:

- PLC Program Panel (Cat. No. 1774-TA or -TH)
- Digital Cassette Recorder (Cat. No. 1770-SA)
- Many RS-232-C compatible data terminals which may be hardcopy printers, display devices or tape readers and punches

Each of these devices communicates with the Interface Module through a specific interconnecting cable at a communication baud rate required by the device.

The **Series B** Program Panel Interface Module was designed specifically for use with Processors having Cat. No. 1774-LP3, -RP3, -RP4. ¹ Introduced in the second quarter of 1979, the Series B Module represents a product enhancement, yet includes the features of earlier Modules. For the first time the Module incorporates a requirement that 9 words of memory be reserved at the end of the PLC controller memory. (Refer to Paragraph 8.0 for specific details.)

Also, with this Module seated in the Processor, the RUN/PROGRAM LOAD Mode Select Switch position provides an on-line data change feature, as specified in Paragraph 3.2. ²

All programming functions possible with the now superseded Cat. No. 1774-TB Module, and all enhancements of the Cat. No. 1774-TB2, **Series A** Module are included in the **Series B** Program Panel Interface Module. (Refer to Paragraph 10.0.)

The Series B Module incorporates additional enhanced features, which include:

- Multiple-rung display of as many as 5 single rungs from adjacent or separate locations in the user program
- Various Processor-to-peripheral device communication baud rates selected by Program Panel keyboard entries
- Peripheral device operation initiated from Program Panel keyboard for cases where the peripheral is remotely located, or has no keyboard
- Contact Histogram hardcopy printouts, on many RS-232-C compatible data terminals, of the times, in seconds, an individual input or output is ON or OFF
- Processor mode selection through Program Panel keyboard entries; especially convenient when Program Panel is located remotely from the Processor
- On-Line Data Change, in RUN/PROGRAM LOAD mode, of Timer and/or Counter Preset and Accumulated Values, values of Data Manipulation Instructions, and ON/OFF status of Latch Instructions
- Bit manipulation to alter the ON/OFF status of any bit(s) in the entire 1024-word Data Table; allows an operator to **temporarily** change the status (ON or OFF) of a specific bit in memory from the Program Panel without depending on actual conditions or specially programmed rungs
- Ability to change the state (ON or OFF) of bits used as outputs while removing a rung of user program logic, or while altering certain output Instructions; especially convenient during a controller start-up when simulated I/O operating conditions are needed since devices are not fully integrated.
- Search function which can be used to locate **every** Instruction of the type specified

These features are explained throughout this Publication.

1.1 Connections — The Program Panel Interface Module is installed in Processor Slot No. 0, which is the left-most slot. The specific cable which attaches to the Module's front connector is determined by the device which has been selected for communication with the Processor. A list of cables is given in Table A.

1.2 Indicators — The Program Panel Interface Module has two red diagnostic indicators located directly above its front connector. (Refer to Figure 1.) These are:

- CHANNEL ACTIVE
- ERROR

The CHANNEL ACTIVE indicator, which is the lower, illuminates when power is applied to, and proper connection exists between, the Program Panel (or a data terminal) and the Program Panel Interface Module. When these conditions exist, the indicator is normally ON.

¹ Note that these Catalog Numbers imply a Processor Chassis with Cat. No. 1774-LA2. Additionally note that this Interface Module may also be used **without** any physical modification in PLC Processors with Cat. No. 1774-LP1, -LP2, -RP1, -RP2, all of which used a Chassis with Cat. No. 1774-LA. However, in these Processors/Chassis, all of the Series B Interface Module's features may not be functional. Refer to Table M.

² On the Series A version of the Module, the RUN/PROGRAM LOAD mode functioned exactly the same as the RUN-MONITOR mode.

TABLE OF CONTENTS

Par. No.	Title	Page
1.0	Introduction	1
1.1	Connections	1
1.2	Indicators	1
2.0	Program Panel	2
2.1	Program Entry	3
2.2	Program Editing	3
3.0	Features	3
3.1	Remote Mode Selection	3
3.2	On-Line Data Change	4
3.3	Output Bit Control Feature	4
3.4	Bit Manipulation, Monitoring	5
3.4.1	Manipulation	6
3.4.2	Monitoring	8
3.5	Instruction Search	8
3.6	Multiple-Rung Display	8
4.0	Contact Histogram	9
4.1	Methods of Reporting	11
4.2	Messages	11
5.0	Troubleshooting Aid	11
6.0	Peripherals	12
6.1	Digital Cassette Recorder	14
6.2	Data Terminal	14
7.0	Protected Logic Check	14
8.0	Status Area	14
9.0	Remote Mode Jumper	15
10.0	Series A Module	16
11.0	Supporting Documentation	17
—	Compatibility/Application Notes	17
—	Commands Summary	19

LIST OF FIGURES

Figure	Title	Page
1	Diagnostic Indicators	2
2	Program Panel Interconnect Cable	3
3	Ladder Diagram Format (typical)	3
4	Mode Select Switch Positions	4
5	Bit Manipulation Display Format	6
6	Multiple-Rung Display Format	8
	(typical)	
7	CRT Contact Histogram (typical)	10
8	Remote Mode Jumper	16

LIST OF TABLES

Table	Title	Page
A	Optional Cables Used with Program	2
	Panel Interface Module	
B	Remote Mode Select Commands	4
C	Series B Module Displays	5
D	On-Line Data Change Keying	6
	Sequence	
E	Output Bit Control Keying	7
	Sequence	
F	Bit Manipulation Keying Sequence	7
G	Multiple-Rung Display Keying	9
	Sequence	
H	Contact Histogram Displayable	11
	Instructions	
I	Contact Histogram Keying	12
	Sequence	
J	Acceptable Data Terminals (typical)	13
K	Baud Rate Selection Keying	13
	Sequence	
L	Peripheral Function Keying	14
	Sequence	
M	Program Panel Interface Module	15
	Features	
N	Supporting Documentation	16
O	Modules Requiring Status Area	17

Table A

OPTIONAL CABLES USED WITH PROGRAM PANEL INTERFACE MODULE

CABLE NAME	Cat. No.	CONNECTS WITH
Program Panel Interconnect Cable	1774-TC	PLC Program Panel
Cassette Recorder Interconnect Cable	1774-TD	Digital Cassette Recorder
Direct Data Terminal Cable	1774-TG	Many RS-232-C Compatible Data Terminals

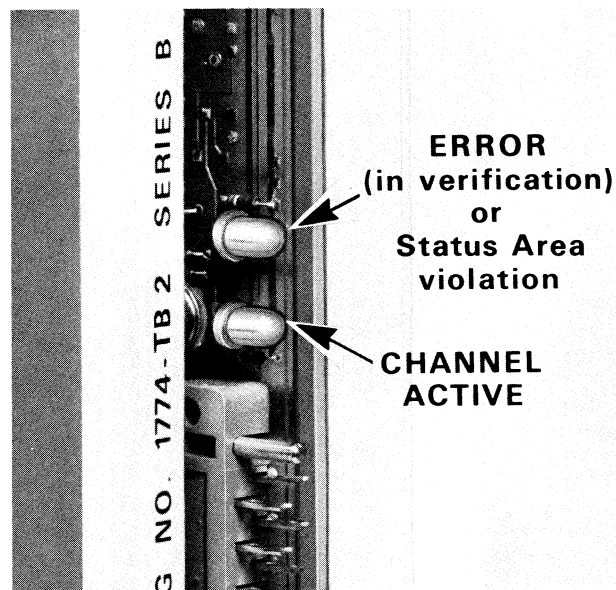


Figure 1 – Diagnostic Indicators

The ERROR indicator, which is the higher, illuminates when the first miscomparison "error" is detected during a verification operation with the Digital Cassette Recorder. Therefore, in most instances the ERROR indicator is normally OFF.

The ERROR indicator has a new, second function on the Series B Module. If a user places this Module in a Processor in which any of the last 9 words of memory contain user program Instructions or Data Files and Messages, the red indicator illuminates. All outputs controlled by the Bulletin 1774 PLC controller are disabled when the Mode Select Switch is moved to, or is presently in, RUN/PROGRAM LOAD or RUN-MONITOR mode. (A complete explanation is given in Paragraph 8.0.)

2.0 Program Panel — The Program Panel Interface Module is used with the PLC Program Panel for initial user program entry, application troubleshooting, ladder diagram printouts, monitoring application timing functions through the Contact Histogram function and Interface Module identification by means of the CRT display. (This device is ordered separately.)

The Program Panel can be used to identify the Series and Revision levels of the Program Panel Interface Module. After power is applied to the Processor and the Program Panel, press [TTY] [CANCEL COMMAND]. The following message appears for the Series B, Revision A Interface Module:

READY TB2 (SER B/A)

Press [DISPLAY] to clear the CRT screen and enable the keyboard for program entry, editing, or monitoring.

The Interface Module connects to the Program Panel through the 15-foot Program Panel Interconnect Cable (Cat. No. 1774-TC), which is also ordered separately. (Refer to Figure 2.)

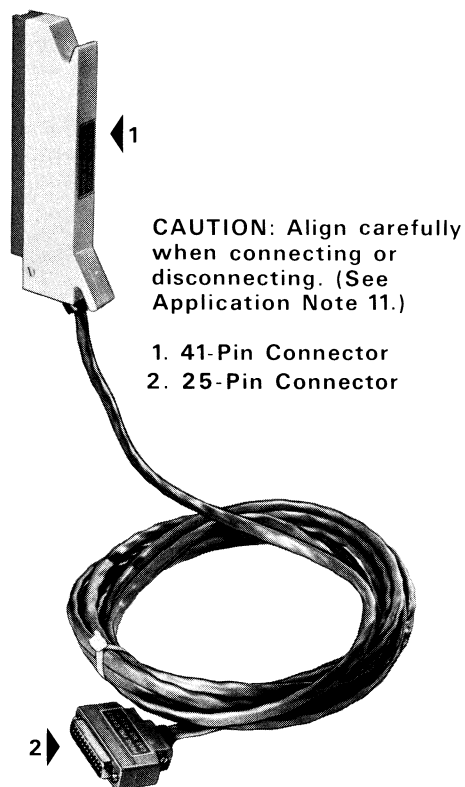


Figure 2 — Program Panel Interconnect Cable

2.1 Program Entry — The initial development and entry of the user's PLC program is usually done manually through the PLC Program Panel. The controller uses a simple programming language, the ladder diagram, which is easy to understand; requires **no** previous programming knowledge; employs quickly recognized symbols; and parallels relay logic in format. (Refer to Figure 3 where a hardcopy printout of a segment of a typical program is shown.)

As PLC Instructions are entered on the keyboard, the corresponding "Instruction elements" are displayed on the Program Panel CRT screen. Each PLC program Instruction has a unique CRT element and position in the rung. This allows the programmer to visually confirm that the correct Instructions, addresses, and control logic are being entered. (Refer to Figure 3.)

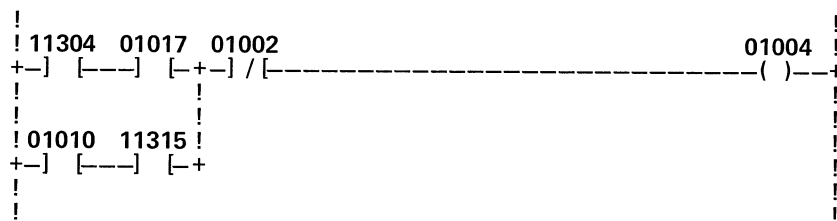


Figure 3 — Ladder Diagram Format (typical)

2.2 Program Editing — Editing the user application program after initial program entry can be accomplished using the common editing features available on previous Modules. The Series B Module also provides enhanced editing features such as:

- On-Line Data Change
- Output Bit Control
- Instruction Search

The On-Line Data Change and Output Bit Control editing procedures both increase the ease and flexibility of performing data changes.

Output Bit Control feature allows the user to control the status (ON/OFF) of bits in memory which had previously been used for Instructions but which were removed from the program during "remove rung" and "change output Instruction" operations.

The Instruction Search allows an operator to locate and display each rung in the program where a specified type of Instruction is used.

All of these are discussed in detail in Paragraph 3.0, which follows.

3.0 Features — Program entry and editing capabilities of the Program Panel Interface Module have been enhanced, through new features of the **Series B** Program Panel Interface Module (Cat. No. 1774-TB2). These features include:

- Remote Mode Selection
- On-Line Data Change
- Output Bit Control (in user program areas)
- Bit Manipulation (in entire 1024 Data Table)
- Instruction Search
- Multiple Rung Display

The following Paragraphs describe each of these features in detail.

3.1 Remote Mode Selection — The **Series B** Program Panel Interface Module provides 3 new Program Panel commands which allow change, **from the Program Panel**, of **all** Processor operating modes. Specifically, the commands activate the following Processor modes of operation:

- REMOTE RUN-MONITOR
- REMOTE TEST-MONITOR
- REMOTE PROGRAM LOAD

These commands may only be entered on the keyboard while the Mode Select Switch on the Processor is in the RUN/PROGRAM LOAD position. (Refer to Figure 4. A summary of required commands is shown in Table B.)

The value of these commands may be seen in a quick summary of typical application conditions. Frequently it is desirable to use the Program Panel at the machine or process site in order to aid initial system debugging and troubleshooting. Monitoring and subsequent programming

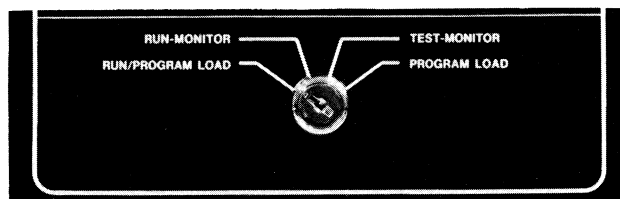


Figure 4 – Mode Select Switch Positions

require the frequent switch selection of an appropriate Processor mode. When these operations are performed at, or near, the PLC Processor, the Processor's Mode Select Switch is readily available. However, when using a Remote I/O PLC controller, or a Local I/O controller in a plant where there is a central control room, the machine or process may be located at some distance from the Processor. In such circumstances, the Mode Select Switch on the Processor is no longer within convenient reach. This results in either lost time and/or the use of additional personnel with an intercommunication system. And thus the Series B Module's Remote Mode Select feature minimizes such inconvenient arrangements because the operator is given full control of the Processor's mode of operation from the remotely located Program Panel. Within the limits of the controller and safety, the user can observe, modify, test, and reprogram while near the controlled device.

Table B

REMOTE MODE SELECT COMMANDS ¹

MODE DESIRED	COMMAND ²
RUN/MONITOR	[SEARCH] [5] [9] [0]
TEST/MONITOR	[SEARCH] [5] [9] [1]
PROGRAM LOAD	[SEARCH] [5] [9] [2]
¹ Mode Select Switch must be in RUN/PROGRAM LOAD position. ² Refer to Table C for resulting display on CRT screen.	

Note that the Program Panel can be optionally used up to 5000 cable-feet from the Processor, if the user supplies an extended cable, as described in the Publication 1774-941.

As an operator aid, the selected Processor mode of operation is displayed as an English message at the bottom of the Program Panel screen to give visual indication of the operating mode. Refer to Table C where all messages are listed.

If for some reason, power to the PLC controller is removed, upon restoration, the specific mode of operation – remotely selected prior to removal – is automatically resumed.

The user may also find the Remote Mode Selection feature a convenient means of changing the Processor's mode of operation in local installations. This eliminates the need to leave the Program Panel to change the Processor's mode of operation from the Mode Select Switch.

3.2 On-Line Data Change – The Series B Program Panel Interface Module offers an On-Line Data Change feature which may be utilized during PLC controller operation. (In other words, it is not necessary to switch to the output-disabling PROGRAM LOAD mode.) It can be used to change:

- Numeric values of GET, LES and EQU Instructions

- Accumulated and Preset Values of Timer and/or Counter Instructions
- ON/OFF state of LATCH Instructions

In order to effect this type of data change, the Processor must be operating in the RUN/PROGRAM LOAD mode.

The On-Line Data Change capability may be applied, **without** interruption, to continuously operating processes and machines such as found in chemical, pulp and paper, and food processing/beverage industries. In these and other applications, machine "downtime" must be minimized because of operational necessities.

The feature offers 2 operator interactive messages which inform the user of the status of the operation.

After the actual Data Change operation is initiated by means of Program Panel keyboard entry, the message ON-LINE DATA CHANGE appears near the bottom of the Program Panel screen. The message remains on the screen until the operation is terminated. New data, as entered from the keyboard, is displayed near the ON-LINE DATA CHANGE message. Once the user confirms that the correct data has been entered, he presses [INSERT]. A second message, EXECUTE, is then displayed to the far right of the ON-LINE DATA CHANGE message. EXECUTE remains on the screen for approximately 1 second. The new Timer/Counter Preset or Accumulated Value, or numeric value of GET, LES and EQU Instruction has been entered into memory when this message appears.

Should the user make an error during entry, corrections can be easily made, but they must be made **prior** to pressing [INSERT]. The keyboard entry [CANCEL COMMAND] can be pressed to cancel an incorrect entry or to terminate the On-Line Data Change operation.

CAUTION: The user must thoroughly understand the program and the consequences of changing machine or operation/process parameters while the Processor is operating in the RUN/PROGRAM LOAD mode. Those who are not familiar with the machine or operation/process are advised to seek the help of someone who is **before** initiating changes. Unexpected machine operation could result.

The keying sequence which must be followed for On-Line Data Change is summarized in Table D.

3.3 Output Bit Control Feature – The Series B Program Panel Interface Module offers an Output Bit Control feature. It concerns those bits used as outputs in the user program area of the memory.

In order to understand the value of this feature, a brief summary of the more common output removal or change conditions is included here.

As with previous versions of this Module, the PLC controller Instruction set provides various Bit Control Instructions. These are:



Energize output device at addressed terminal (non-retentive)



De-energize output device at addressed terminal (non-retentive)



Latch output device ON at addressed terminal (retentive)



Unlatch output device at addressed terminal

Also the PLC controller normally allows a user to remove a rung of logic from the user program; to change the specific Bit Control Instruction to an entirely different Instruction; or to change only the 5-digit address of a specific Bit Control Instruction. In general, the Data Table

Table C
SERIES B MODULE DISPLAYS

FUNCTION	PRESS	ASSOCIATED DISPLAY
REMOTE MODE SELECT FEATURE		
Remote Mode Select 1	[SEARCH] [5] [9] [0] [SEARCH] [5] [9] [1] [SEARCH] [5] [9] [2]	REMOTE RUN/MONITOR REMOTE TEST/MONITOR REMOTE PROGRAM LOAD
BAUD RATE SELECTION 2		
110 300 600 1200 2400 4800 9600	[DISPLAY] 3 [2] [DISPLAY] [3] [DISPLAY] [4] [DISPLAY] [5] [DISPLAY] [6] [DISPLAY] [7] [DISPLAY] [8]	RECORD 2, 110 BAUD RECORD 3, 300 BAUD RECORD 4, 600 BAUD RECORD 5, 1200 BAUD RECORD 6, 2400 BAUD RECORD 7, 4800 BAUD RECORD 8, 9600 BAUD
PERIPHERAL DEVICE FUNCTION 2		
Binary Dump Binary Load Binary Verify Ladder Diagram	[SEARCH] [4] [1] [SEARCH] [4] [2] [SEARCH] [4] [3] [SEARCH] [4] [4]	DUMP LOAD VERIFY LADDER
CONTACT HISTOGRAM		
Display Interrupt Changed to ON Changed to OFF Histogram Buffer Full Buffer Reset	[DISPLAY] 5 5 5 5	2124.06----- 4 0059.78-ON-- 4 5308.40-OFF- 4 *BUFFER FUL* ****RESET***
OTHER		
On-Line Data Change Bit Manipulation 1 Status Area Violation Available Memory Used Function Being Performed Protects Protected Logic	[SEARCH] [5] [1] [SEARCH] [5] [3] 5 5 5 5	ON-LINE DATA CHANGE WORD 000 MEMORY END ERROR MEMORY FULL EXECUTE NOT VALID
1 Mode Select Switch must be in RUN/PROGRAM LOAD position. 2 Note: Baud Rate Selection commands must be entered each time a Peripheral Device Function command is entered. If both are not used together, the intended operation cannot be initiated. Enter Baud Rate commands before Peripheral Function commands. 3 This keyhead shows [DISPLAY/RECORD] for Program Panels modified for use with the Bulletin 1772 PLC-2 controller. 4 Numbers here represent the seconds a contact Histogram Instruction has been ON, OFF, or they represent the elapsed time since the last change in state. 5 No definite keying sequence. Refer to particular description.		

bit corresponding to these Instructions is now automatically cleared to "0" after any one of these operations.

The enhanced Series B Module's Output Bit Control feature allows a user to go beyond these functions to control the state (ON/OFF) of the 5-digit output bit address being changed during the above-mentioned editing operations.

Should the state not be a matter of concern, the user may simply make the change: the bit defaults to an OFF ("0") state. Exact step-by-step procedures which must be fol-

lowed are given in Table E. Note that the steps are divided into Rung Removal and Editing Output Instructions.

The Processor must be operating in either PROGRAM LOAD mode or REMOTE PROGRAM LOAD mode for the Output Bit Control feature to function properly.

The feature is a useful editing tool, especially during a system start-up or program modification.

3.4 Bit Manipulation, Monitoring — The Bit Manipulation and Monitoring features control **only** those bits located in

Table D
ON-LINE DATA CHANGE KEYING SEQUENCE

STEP	DESCRIPTION
1	Select RUN/PROGRAM LOAD position on Processor's Mode Select Switch.
2	Press [SEARCH] [5] [1]. The message ON-LINE DATA CHANGE appears near the bottom of the CRT screen.
3	Move cursor to Timer, Counter, GET, LES or EQU Instruction whose numeric value will be changed, or the LATCH Instruction whose ON/OFF status will be changed.
4	Enter new 3-digit numeric value for GET, LES, EQU, or Timer and/or Counter Preset Value. This number will be displayed after the ON-LINE DATA CHANGE message. If an entry mistake is made, the correct value may be entered at this time. Also press [1] to set a LATCH Instruction to ON. Press [0] to clear the LATCH Instruction to OFF. 1 The numbers entered are displayed at the bottom of the screen. Verify that they are correct.
5	Press [INSERT]. The message EXECUTE temporarily appears on the CRT screen to the right of the On-Line Data Change message. The new data is written into memory.
6	Enter new 3-digit numeric value for Timer and/or Counter Accumulated Value. Note that the Accumulated Value of non-retentive Timers can only be changed when the Timer is energized. Verify that the numbers displayed at the bottom of the screen are correct.
7	Press [INSERT]. EXECUTE again appears on the screen as the new value is entered into memory.
8	Press [CANCEL COMMAND] to terminate the On-Line Data Change operation.

1 LATCH Instruction only: skip Steps 5, 6, and 7. The LATCH Instruction state from the user program overrides this feature. The state of the Instruction is indicated on the CRT screen by bright intensity for ON, or energized, and normal intensity for OFF, or de-energized.

the Data Table. (This includes all 3 sizes: 256, 512 and 1024 Data Tables.) Each is described separately here.

3.4.1 Manipulation — The Bit Manipulation feature allows a user to change, from the Program Panel keyboard, the status (ON/OFF) of **any bit in that area** of the memory, regardless of the Data Table size selected.

The technique, performed in the RUN/PROGRAM LOAD mode, causes all 16 bits of an individual word to be displayed on the Program Panel along with the selected 3- or 4-digit word address. (Refer to Figure 5.) Immediately under the bit numbering pattern common to PLC controller literature (17-10, 07-00), the states of the individual bits appear. A "1" represents ON, or energized; a "0" represents OFF, or de-energized. The left/right movement of the cursor, initiated by the operator at the Pro-

gram Panel keyboard, allows an operator to select the specific bit to be manipulated.

Refer to Table F where the technique is shown.

The manipulated bit's status (ON/OFF), as represented by '1' or '0' on the CRT screen, is subject to further control if its 5-digit address appears in the user program. Although the user may set a bit to ON or clear it to OFF, the logic of the user program overrides any manipulation performed with this technique.

By contrast, a bit whose address does **not** appear in the user **program** can be changed to ON or OFF under complete control of the Bit Manipulation feature. The bit's status is maintained indefinitely in core—nonvolatile—memory.

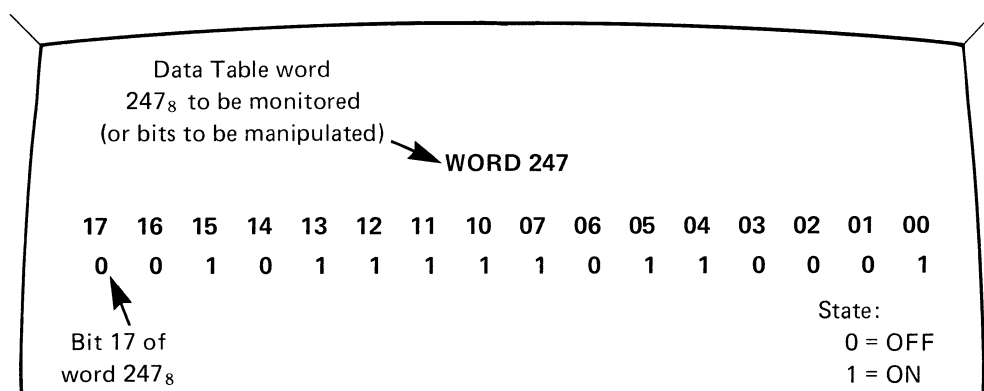


Figure 5 — Bit Manipulation Display Format

Table E
OUTPUT BIT CONTROL KEYING SEQUENCE

STEP	DESCRIPTION
REMOVE RUNG	
1	Use Search functions to locate and display the rung to be removed.
2	Select PROGRAM LOAD or REMOTE PROGRAM LOAD mode. (Refer to Table B for REMOTE PROGRAM LOAD mode keying sequence.)
3	Press [REMOVE] [RUNG] . The message OFF is displayed near the bottom of the CRT screen.
4	Press [0] to clear the output bit in memory to OFF or press [1] to set the bit to ON. Output bit in memory is automatically cleared to OFF if neither a [0] or [1] is pressed.
5	Press [RUNG] . The message EXECUTE temporarily appears on the CRT screen as the rung is removed.
6	Press [CANCEL COMMAND] to terminate the remove rung operation.
EDITING OUTPUT INSTRUCTIONS	
1	Locate and display Output Instruction to be changed. (For an Output Instruction this must be a 5-digit address.)
2	Select PROGRAM LOAD or REMOTE PROGRAM LOAD mode. (Refer to Table B for REMOTE PROGRAM LOAD mode keying sequence.)
3	Press  ,  ,  , or  . The message OFF is displayed near the bottom of the CRT screen.
4	Press [0] to clear the output bit in memory to OFF. Press [1] to set the bit to ON. Output bit in memory is automatically cleared to OFF if neither a [0] or [1] is pressed.
5	Press  ,  ,  , or  . The new Instruction replaces the previous Instruction. Enter a new address or the address of the previous Instruction.
6	Press [CANCEL COMMAND] to terminate the operation.

Table F
BIT MANIPULATION KEYING SEQUENCE

STEP	DESCRIPTION
1	Select RUN/PROGRAM LOAD position. 1
2	Press [SEARCH] [5] [3] . The message WORD 000 is displayed near the top center position on the CRT screen.
3	Enter the 3- or 4-digit address to be displayed.
4	Press [→] and/or [←] to move the cursor to the bit to be changed.
5	Press [1] to set the bit to ON: the digit "1" is displayed in that bit position. Press [0] to clear the bit to OFF: the digit "0" is displayed in that bit position.
6	Press [CANCEL COMMAND] to terminate the Bit Manipulation function.
1 Any Mode Select Switch position may be used if the bit's state is only monitored.	

Controlling the status of Data Table bits is a temporary technique that may be applied during system start-up and sequencing operations. Previously, the user programmed rungs which set a **single bit** to ON or OFF — a time-consuming procedure. Now the user wastes no memory, need not remember after start-up to remove test rungs, and can change the state of **16 bits** in much less time.

Two Program Panel keys allow the operator to quickly display adjacent Data Table words, thereby avoiding the inconvenience of entering another 3- or 4-digit address. These keys are [RUNG ↑] and [RUNG ↓].

3.4.2 Monitoring — Actual manipulation, or change, of bit states may not always be necessary. The technique may also be used to only monitor the status of bits in the Data Table. The Bit Monitor feature becomes especially valuable in troubleshooting controllers where I/O Racks are not immediately visible to maintenance personnel—as may be the case in a Remote I/O Installation. The Data Table bit display may serve the same function as the diagnostic status indicators on the I/O Arm Assemblies: an illuminated indicator is the equivalent of a bit set to “1” on the display screen.

Monitoring may be performed with the Mode Select Switch in any position.

3.5 Instruction Search — The Series B Program Panel Interface Module provides an Instruction Search feature which is valuable for both monitoring and editing purposes. With it, an operator can locate and display each program rung in which a specified type of Instruction is used. (All PLC Instructions are accessible.)

The technique is simple. It may be initiated in **any** Processor mode of operation at **any** point in the program. Then:

- Press [SEARCH] and enter the type of Instruction. (For example, Examine ON or De-energize Output.)
- Press [DISPLAY].

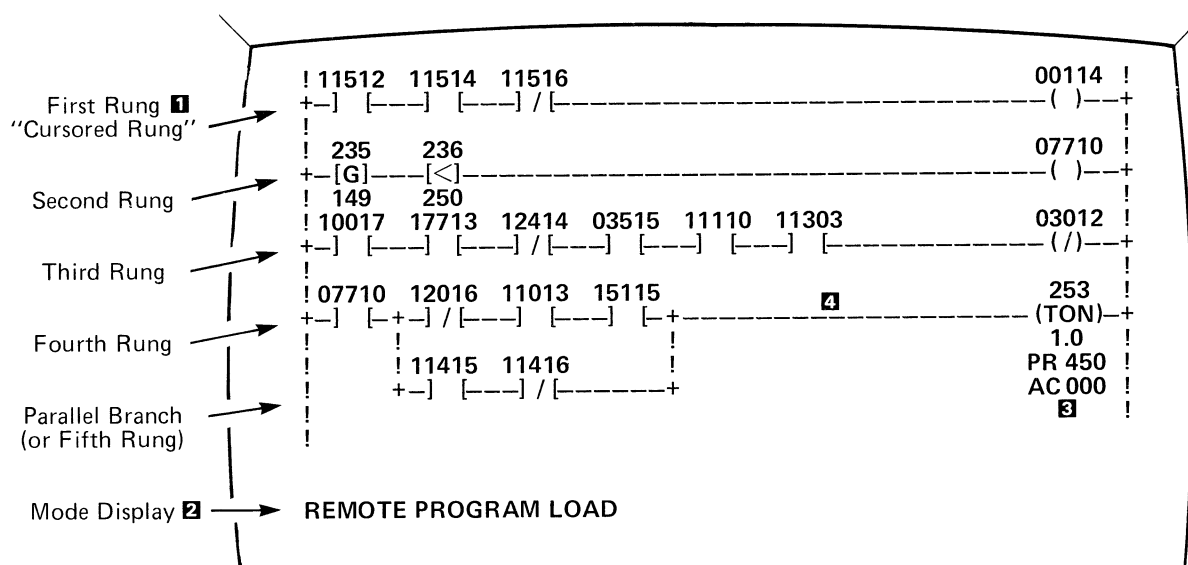
The next rung in the program that contains that Instruction is then displayed. To advance to the next use, press [SEARCH].

3.6 Multiple Rung Display — The Multiple Rung Display feature permits the simultaneous display, on the Program Panel CRT screen, of up to 5 single rungs in the user program for monitoring purposes. These rungs may **each** be from any point in the program, as specified by the user. By displaying rungs that are interdependent, or in some way related, even though they are from different parts of the program, maintenance personnel can more effectively troubleshoot the controlled machine or process.

The exact number of rungs—up to a maximum of 5—which can be displayed in this multiple-rung display format depends on the logic construction and the type of Instructions used in each chosen rung.

Each parallel branch reduces by 1 the total number of rungs which may be displayed; each Timer and Counter Instruction reduces by 1 the number of rungs which may be displayed. (Refer to Figure 6.)

However, all other logic constructions and Instructions permit a multiple-rung display having 5 rungs.



- Legend:
- 1 First rung of Multi-Rung Display is "cursored rung" used for editing purposes.
 - 2 Operator message displaying which of the 3 basic modes was selected from the keyboard.
 - 3 Timer or Counter Instruction on last rung permits a Multiple Rung Display having 4 rungs of user-program logic.
 - 4 A rung may contain as many as 9 series elements plus an output Instruction. Note that the length of each rung in this illustration has been shortened.

Figure 6 — Multiple-Rung Display Format (typical)

The Multiple Rung Display feature may be used with the Mode Select Switch in any position. ¹ The feature is initiated **and** cancelled by the same keyboard entries: [SEARCH] [DISPLAY]. Here, it is assumed, at initiation, that a single rung is currently being displayed on the Program Panel CRT screen. At this point, three options are available:

- Display the next 4, or perhaps fewer, rungs immediately adjacent "up" or "down" in the program.
- Initiate an automatic, continuous scrolling display of 5, or fewer, rungs.
- Display an additional 4, or fewer, rungs, each of which may be from separate, selected points in the program.

Each is explained in immediately following paragraphs.

A displayed rung, whether it be the first or last rung on the screen, may be replaced by an adjacent rung in the user program. To display a rung **preceding** the first displayed rung, enter [RUNG ↑]. To display a rung **following** the last displayed rung, enter [RUNG ↓].

The Multiple Rung Display feature also permits a continuous, full-screen scrolling action either "up" into the user program or "down" into the program to the END (of program) Instruction. Upward scrolling action continues until the first user program rung has been displayed. (The screen display then settles on the Data Table size statement which precedes the first user program rung. Subsequently, downward scrolling action **can only** be resumed after the first user program rung is positioned on the top line of the CRT screen.)

Downward scrolling action continues until the END (of program) Instruction is displayed. (Upward scrolling action can be resumed from this point, without having to

position user program rungs on the last line of the CRT screen.)

Both upward and downward scrolling may be terminated by pressing [CANCEL COMMAND].

Continuous full-screen scrolling "down" into the program is initiated by pressing [DISPLAY] [RUNG ↓]. All 5, or fewer, rungs are written onto the display. When all are displayed, the top rung is replaced with the next rung in the program, and the other displayed rungs are replaced with the one following. Continuous full-screen scrolling "up" the user program is initiated by pressing [DISPLAY] [RUNG ↑]. All 5, or fewer, rungs are written onto the display. When all are displayed, the top rung is replaced with the preceding (undisplayed) rung in the program, and the other displayed rungs are successively replaced with the one preceding it.

Multiple-rung display of rungs from separate locations in the user program is possible, assuming a rung is currently being displayed. To display the next desired rung, press [DISPLAY] [X] [Y], where [X] is an output Instruction and [Y] is the Instruction's address. ² A total of 4 selected rungs, plus the initial rung, may be displayed, although with complex logic constructions, there may be fewer.

¹ In a PROGRAM LOAD mode during the entry of a user program, only 1 rung is actually displayed since no other rungs follow. Also, during an Insert Rung editing operation, only that rung may be displayed.

² A knowledge of the program, perhaps in the form of a hard-copy ladder diagram printout, is useful in determining which Instruction and address to display. The output address may have 3, 4 or 5 digits.

Table G
MULTIPLE-RUNG DISPLAY KEYING SEQUENCE ¹

STEP	DESCRIPTION
ADJACENT RUNGS	
1	Press [SEARCH] [DISPLAY] to initiate Multiple-Rung Display.
2	Press [RUNG ↑] repeatedly to display as many as 4 additional rungs which precede the one displayed. Press [RUNG ↓] repeatedly to display as many as 4 additional rungs which follow the displayed rung.
3	Press [SEARCH] [DISPLAY] to cancel Multiple-Rung Display and to resume single-rung display format.
RUNGS FROM NON-ADJACENT LOCATIONS	
1	Press [SEARCH] [DISPLAY] to initiate Multiple-Rung Display.
2	Press [DISPLAY]. Enter the Output Instruction and the address for the corresponding rung to be displayed. (Up to 4 Output Instructions, in addition to the one displayed, can be observed.)
3	Press [SEARCH] [DISPLAY] to cancel Multiple-Rung Display and resume single-rung display format.
RUNG SCROLLING	
1	Press [SEARCH] [DISPLAY] to initiate Multiple-Rung Display.
2	Press [DISPLAY] [RUNG ↑] to begin continuous, full-screen scrolling to the beginning of the user program. Press [DISPLAY] [RUNG ↓] to begin continuous, full-screen scrolling to the END (of program).
3	Press [SEARCH] [DISPLAY] to cancel this scrolling action, and to resume single-rung display format.
¹ Operates with the Processor's Mode Select Switch in any position.	

The keying sequence used to establish a typical multiple-rung display is given in Table G. An example of the feature is shown in Figure 6.

Note that if an editing operation is initiated during a multiple-rung display, only the top-most rung of the display is considered the "cursored rung." Thus **only** the first rung may be edited. If it is necessary to edit another rung, it must be advanced to the top line on the CRT screen.

Multiple-rung displays are cancelled by pressing [SEARCH] [DISPLAY]. After cancellation, or at power-up, the Program Panel reverts to single-rung display.

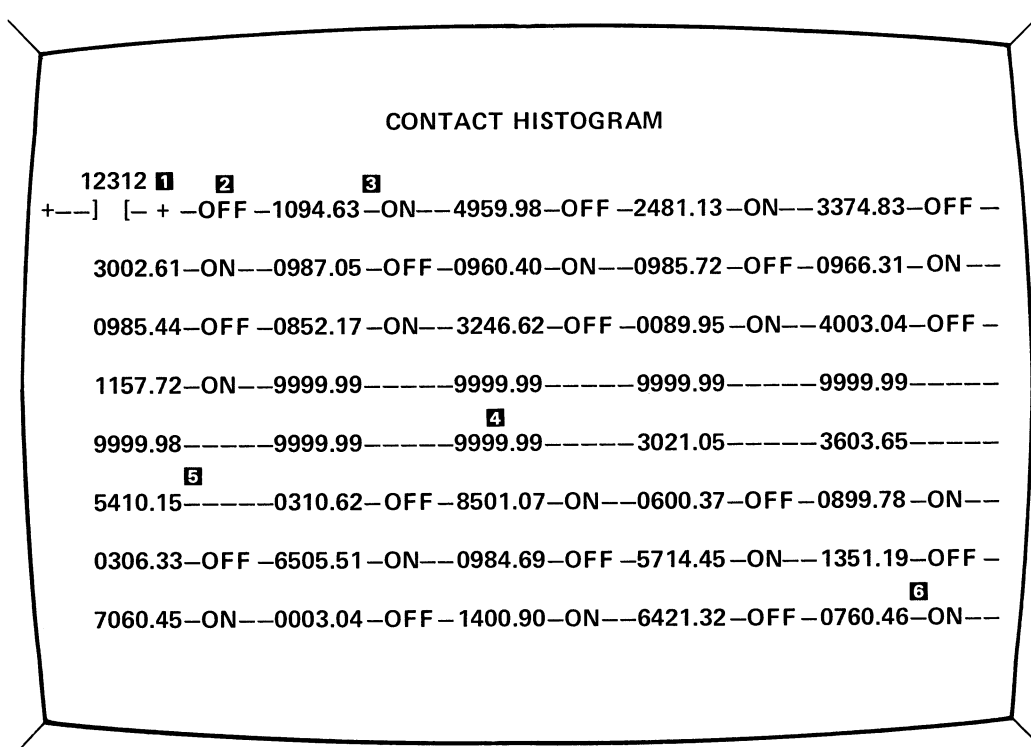
4.0 Contact Histogram – The Contact Histogram feature's capability has been expanded. The ON/OFF history, measured in seconds, of devices connected to the PLC controller's input terminals can now be recorded on hardcopy by compatible RS-232-C data terminals. The Contact Histogram can also be viewed on the Program Panel CRT screen, as was possible with the Series A Program Panel Interface Module (Cat. No. 1774-TB2).

Applications of the Contact Histogram feature include, but are not limited to, the following:

- Cam switch timing and adjustments
- Measuring limit switch time
- Troubleshooting intermittent inputs

Any bit in the Data Table can have an individual Contact Histogram displayed and/or printed. The bit chosen for examination need not appear in the user program. Additionally, the 5-digit address of the bit need not appear in the user program with the same type of Instruction as the Instruction being examined by the Contact Histogram function. For example, assume the TON Instruction having address 260 appears in a user program. A Contact Histogram using Examine On 26017 would show the ON and OFF times the Timer has been energized and de-energized, even though an actual Examine On Instruction 26017 does not appear in the user program.

Many—though not all—PLC Instructions may have their Contact Histogram displayed and/or printed. A list of these Instructions is presented in Table H. The Contact Histogram feature, as seen on the PLC Program Panel is shown in Figure 7.



- Legend :
- 1** 5-Digit address of Instruction being examined by Contact Histogram function.
 - 2** Initial state is OFF.
 - 3** After 1094.63 seconds (approximately 18 minutes) the Instruction's bit in memory changes to ON.
 - 4** Histogram Instruction's bit in memory has not changed state for 7 maximum timing intervals (7 x 9999.99 or approximately 19.5 hours).
 - 5** User presses [DISPLAY] three times. The first time after 3021.05 seconds (approximately 50 minutes) since the last display. The second time after 3603.65 seconds (approximately 60.5 minutes) since [DISPLAY] was last pressed. The third time after 5410.15 seconds (approximately 90 minutes) since [DISPLAY] was last pressed.
 - 6** Thirty-ninth timing interval, which is maximum number of displayable intervals.

Figure 7 – CRT Contact Histogram (typical)

Table H

CONTACT HISTOGRAM DISPLAYABLE INSTRUCTIONS

INSTRUCTION	DISPLAYABLE?	
	YES	NO
    	X	
 	X	
   		X
   		X

The PLC controller's Contact Histogram has these notable features:

- Display on the CRT screen of 39 (maximum) ON and OFF time intervals
- Each timing interval may be as long as 9999.99 seconds, or approximately 2.78 hours
- Two display modes selectable by the user; allows either continuous or non-continuous Histogram updating
- Continuous Histogram updating, when printed by a data terminal/prINTER, can record the Instruction's status changes over an extended period of time

4.1 Methods of Reporting — Depending on particular needs and available equipment, an Instruction's Contact Histogram can be:

- Displayed on the Program Panel CRT screen
- Simultaneously displayed on the Program Panel CRT screen and recorded by a data terminal/prINTER
- Only recorded on hardcopy by a data terminal/prINTER

The operating procedures which must be followed for each of these operations are listed in Table I.

Each of these operations is discussed in the following paragraphs.

4.1.1 CRT Display — Histogram display on the Program Panel CRT screen is initiated in the same manner as has been the practice since the feature was originally introduced. However, the Series B Program Panel Interface Module (Cat. No. 1774-TB2) slightly changes the display format.

One change is that the Instruction's ON/OFF status is **no longer** indicated by intensified (ON) or normal intensity (OFF) symbolic or relay equivalent representations. The Instruction's status changes are indicated by the words ON or OFF being displayed after each timing interval. (This modification makes it possible to display 5 status changes across the CRT screen, for a total of 39 changes. Previously, only 31 status changes could be displayed on the CRT screen at one time.)

4.1.2 CRT Display and Hardcopy — The Contact Histogram can be simultaneously displayed on the Program Panel CRT screen and recorded by data terminal/prINTER when the peripheral device is connected to the Program Panel and 110 baud rate is selected. (Connections required are described in Paragraph 6.0.) If baud rates other than 110 are selected, the CRT screen is filled with meaningless data during Histogram printing.

4.1.3 Hardcopy — Contact Histogram hardcopy printouts only may be obtained, using many types of RS-232-C compatible data terminals/printers. These data terminals/printers, which operate at many baud rates from 110 to 9600 baud, are an especially convenient means of recording specific machine or input device cycles over an extended period of time, for example a weekend. The resulting printout can then be used for troubleshooting purposes and productivity reporting.

4.2 Messages — Two new messages are associated with the hardcopy Contact Histogram feature. The following paragraphs describe what the messages mean and when they occur.

4.2.1 BUFFER FUL — If the Instruction having its Contact Histogram examined changes state very rapidly, it is possible that an internal storage area overflows. The message *BUFFER FUL* is then displayed/printed to indicate a storage area, or buffer, overflow. (Buffer is a temporary storage area on the Program Panel Interface Module that is capable of storing 140 Contact Histogram status changes.) Continued Instruction sampling stops until all 140 timing intervals stored in the buffer have been printed/displayed. Therefore, the individual status changes which occur after the buffer is filled are not recorded.

4.2.2 RESET — Once all timing intervals have been emptied from the buffer, the message ****RESET**** is printed/displayed. The digits which immediately follow this message represent the **total elapsed** time from buffer overflow to the first Instruction change of state to occur after the buffer has been emptied. If continuous Contact Histogram operation was selected, continued Instruction sampling automatically resumes after the buffer is emptied.

However, if manually updated Histogram is selected, the user must press [DISPLAY] on the Program Panel keyboard (or [D] on the data terminal/prINTER keyboard) 4 times to clear the buffer. Each time [DISPLAY] (or [D]) is pressed, the next 39 intervals which were stored in the buffer are printed and/or displayed.

Once the Reset message is printed and/or displayed, press [DISPLAY] (or [D]) again to continue Contact Histogram sampling.

In those applications where it is imperative that immediate Contact Histogram printouts/displays record all Histogram Instruction changes, and where no changes can be missed, using a data terminal/prINTER having a higher baud rate may eliminate the gap; a higher baud rate device may empty the buffer faster than Histogram data can be stored there, although the speed of status changes is the determining factor.

5.0 Troubleshooting Aid — The PLC Program Panel and the Program Panel Interface Module are valuable maintenance and troubleshooting tools. They can be used to monitor input and output device status while the process or machine is controlled by the Processor. Either single-rung or multiple-rung display formats may be used. Deviations in the known control sequence can be found by observing CRT element intensity variations which correspond to the ON/OFF status of user-programmed logic functions. (Intensified represents ON; normal intensity represents OFF.) During troubleshooting procedures,

Table I
CONTACT HISTOGRAM KEYING SEQUENCE

STEP	DESCRIPTION
HARDCOPY (PROGRAM PANEL CONNECTED)	
1	Select a mode of operation on the Processor's Mode Select Switch. The mode may be RUN-MONITOR or TEST-MONITOR. Alternately, when the Mode Select Switch is in the RUN/PROGRAM LOAD mode, REMOTE RUN-MONITOR and REMOTE TEST-MONITOR operation, as established according to Table B, may be used.
2	Select baud rate according to Table K. On the Program Panel keyboard, press [DISPLAY] and corresponding numeric key.
3	On the Program Panel keyboard, press [SEARCH] [6] for continuous Contact Histogram operation or press [SEARCH] [7] for manual update Histogram.
4	On the Program Panel keyboard, enter the specific PLC Instruction and its address.
5	On the Program Panel keyboard, press [TTY]. Timing starts after CONTACT HISTOGRAM is printed on paper.
6	On the Program Panel keyboard, press [DISPLAY], [CANCEL COMMAND] to terminate the Histogram.
HARDCOPY (WITHOUT PROGRAM PANEL)	
1	Follow steps 1 thru 4 of Contact Histogram Hardcopy (Program Panel connected).
2	Disconnect Program Panel Interconnect Cable from Program Panel Interface Module.
3	Connect data terminal to Program Panel Interface Module.
4	On the data terminal/printer keyboard, press [D].
5	On the data terminal/printer keyboard, press [ESC] to terminate the operation.
CRT DISPLAY	
1	Select a mode of operation on the Processor's Mode Select Switch. The mode may be RUN-MONITOR or TEST-MONITOR. Alternately, when the Mode Select Switch is in the RUN/PROGRAM LOAD mode, REMOTE RUN-MONITOR and REMOTE TEST-MONITOR operation, as established according to Table B, may be used.
2	On the Program Panel keyboard, press [SEARCH] [6] for continuous Contact Histogram display or press [SEARCH] [7] for manual update Histogram operation.
3	On the Program Panel keyboard, enter PLC Instruction to have its Histogram displayed. Also enter the Instruction's address.
4	On the Program Panel keyboard, press [DISPLAY] to start timing. For manual update Histogram operation only, press [DISPLAY] when screen is full.
5	On the Program Panel keyboard, press [CANCEL COMMAND] to terminate continuous or manual Contact Histogram operation.

these CRT elements may be logically related to the I/O Arm diagnostic status indicators, which correspond to application input and output device status.

The Bit Monitor feature of the Series B, or later, Program Panel Interface Module (Cat. No. 1774-TB2) can also be used as a troubleshooting aid. The ON/OFF status of an individual word's 16 bits can be displayed on the Program Panel screen, thereby permitting remote monitoring of input and output device status. Bit Monitoring duplicates, on a different medium, and in a different form, the function of the I/O Arm status indicators.

6.0 Peripherals — A wide variety of peripheral devices can

be used with the PLC controller. These peripherals perform functions such as data storage, transfer, or duplication, hardcopy printouts and display. The Series B Program Panel Interface Module makes it possible to change the Module's transmission baud rate and/or to initiate a specific function for many of these RS-232-C compatible peripheral devices. (Examples of acceptable data terminals are listed in Table J. Note that this is **not** an inclusive list.)

Series B Module has the ability to establish various Processor-to-peripheral device communication baud rates **from the keyboard** of the Bulletin 1774 Program Panel. These

Table J
ACCEPTABLE DATA TERMINALS (Typical) 1

DATA TERMINAL	RECOMMENDED CONNECTION TO DIRECT DATA TERMINAL CABLE	MANUFACTURER
Silent 700 Series Keyboard/Printer, Model 743, KSR (without MODEM) 2	Cable provided as standard. User must specify EIA RS-232-C connector; specify Bell 103A cable (P/N 983848 3)	Texas Instruments, Inc. Digital Systems Div. P.O. Box 1444 M/S 784 Houston, TX 77001
Silent 700 Series Keyboard/Printer, Model 745, MODEM Standard.	Provided by Auxiliary EIA Interface Cable Kit (P/N 983856 3)	
Keyboard/Printer/Tape Punch Model 33 ASR	Provided by modification kit for "manual answer," (P/N 198420 3)	Teletype Corp. 5555 Touhy Ave. Skokie, IL 60076
Keyboard/CRT Model ADM-3A with 24 lines/1920 characters option	User must provide an adapter cable for connection.	Lear Siegler, Inc. EID/Data Products 714 N. Brookhurst St. Anaheim CA 92803
Keyboard/CRT Model B100-1011-0000	User must provide an adapter cable for connection.	Beehive Medical Electronics, Inc. 870 West 2600 South Box 25668 Salt Lake City, UT 84125
CRT Monitor Model 1440 (panel or desk mount) and Keyboard Model 8440	User must provide an adapter cable for connection.	TEC, Inc. 2727 N. Fairview Ave. Tucson, AZ 85705
1 Not an inclusive list; other models may be acceptable. 2 Available from Allen-Bradley Co. Refer to Publication 1770-902. 3 Vendor part number.		

rates range from 9600 baud to 110 baud. (Refer to Table K.) The baud rate the user selects is the rate required for the peripheral device being used.

With the Program Panel connected between the Module and the device, the user enters the keyboard commands which select the baud rate and the desired peripheral device function. The Program Panel may then be disconnected from the Program Panel Interface Module; the peripheral device may then be connected directly to the Module, and the Program Panel may then be taken elsewhere. The desired function is then enabled at the proper rate. 1 Standard cables are listed in Table A. (Certain applications may require modifications of these cables to provide other baud rates and signals.)

However, if for some reason the Module and the peripheral device are disconnected, then later reconnected, the baud rate and function must be completely re-established since the Module defaults at this time to 9600 baud.

Note that initialization of the Program Panel display automatically establishes the required communication baud rates between the Program Panel Interface Module and the Program Panel. Recall that the commands required are [TTY] [CANCEL COMMAND] [DISPLAY].

1 The previous practice of continuously using the Program Panel between the Module and the peripheral may also be used. In this case [TTY] is pressed to enable the peripheral.

Table K
BAUD RATE SELECTION KEYING SEQUENCE 1

BAUD RATE	PRESS
110	[DISPLAY] [2] 2
300	[DISPLAY] [3]
600	[DISPLAY] [4]
1200 3	[DISPLAY] [5]
2400	[DISPLAY] [6]
4800	[DISPLAY] [7]
9600	[DISPLAY] [8]
1 Peripheral Function command must also be used. Enter it second. See Table L and C. 2 This keyhead shows [DISPLAY/RECORD] for Program Panels which are modified for use with Bulletin 1772 PLC-2 controller. 3 Maximum baud rate for load or verify functions with Digital Cassette Recorder.	

Various peripheral device functions can also be initiated from the Program Panel keyboard. (Refer to Table L.) The various functions include:

- Binary Dump (that is, copy)
- Binary Memory Load
- Binary Verify
- Ladder Diagram Print (on data terminals)
- Contact Histogram (continuous)
- Contact Histogram (manual)

Table L
PERIPHERAL FUNCTION KEYING SEQUENCE 1

FUNCTION	PRESS
Binary Dump (copy) 2	[SEARCH] [4] [1]
Binary Memory Load 2	[SEARCH] [4] [2]
Binary Verify 2	[SEARCH] [4] [3]
Ladder Diagram Printout	[SEARCH] [4] [4]
Contact Histogram (continuous)	[SEARCH] [6]
Contact Histogram (manual)	[SEARCH] [7]
1 Baud Rate Selection command must also be used. Enter it first. See Table K and C. 2 Used with peripheral device other than Cassette Recorder.	

These binary functions—dump, memory load, and verify—**do not** apply to the Digital Cassette Recorder, which has its own commands. They do, however, apply to tape punch devices. (Binary operations are those that transfer or verify the **entire** contents of the PLC controller's memory, and not just the user program. This data is in the form of a string of binary digits.)

Messages for binary dump or copy, load, and verify functions plus ladder diagram printouts are displayed on the CRT screen after the respective function is initiated. The display for each of these functions is shown in Table C.

Peripheral device function selection is especially useful with certain devices which do not have keyboards, such as tape punches and high-speed printers.

Peripheral device operation may be terminated in one of two ways:

- If the device is connected to the Module through the Program Panel, enter [DISPLAY] [CANCEL COMMAND] [DISPLAY].
- If the device and Module are directly connected to each other, simply disconnect the cable.

The data terminal can be connected to the PLC controller in one of two ways. In the first configuration, the data terminal is connected to the Module through the Program Panel.

In the second configuration, the data terminal connects directly to the Series B Program Panel Interface Module. The direct connection is made with the 8-foot Direct Data Terminal Cable (Cat. No. 1774-TG). This Cable (ordered separately) is shipped, factory-wired, for a communications rate of 110 baud, although other communication baud rates are possible.

Various other devices may be used even though they may operate at baud rates other than the 9600 baud required by the Program Panel or the 110 or 300 baud required by a TTY.

6.1 Digital Cassette Recorder — Both the Series B and A

Program Panel Interface Modules may be used with the Digital Cassette Recorder (Cat. No. 1770-SA) to load a user program into, or record the contents of, the PLC memory. The convenient Tape Cassette (Cat. No. 1770-XA) provides a reliable auxiliary storage medium for the user's PLC program.

During the verification of the tape and memory contents, the addresses of as many as 14 errors may be stored by the Interface Module. Later, errors may be recalled on the CRT display screen and corrected.

The Interface Module connects directly to the Cassette Recorder through the 8-foot Cassette Recorder Interconnect Cable (Cat. No. 1774-TD) which must be specified for use with a PLC controller when the Cassette Recorder is ordered.

6.2 Data Terminal — The Program Panel Interface Module may be used with many user-supplied RS-232-C compatible data terminals. Examples of acceptable devices are listed in Table J. Some of the data terminals may record the user's PLC program on punched tape, load a program from punched tape into PLC memory, produce a hard copy printout of either the user program in ladder diagram form or an Instruction's Contact Histogram, or enter Data Handling messages and, subsequently, print Reports.

7.0 Protected Logic Check — Another new feature concerns the optional Protected Logic Module (Cat. No. 1774-DL2). During program entry or editing, the Series B Program Panel Interface Module automatically and continuously checks the user program to determine if rungs unique to Protected Logic programming are part of the program. 1 If Protected Logic programming is found to exist and should a user attempt to make a change in a protected rung, the message NOT VALID is displayed at the bottom of the CRT screen. The attempted change is terminated.

If the user finds it necessary to change the Protected Logic portion of the user program, it is necessary to remove the End of Protected Logic rung to make the necessary program correction. The End of Protected Logic rung **must then be re-entered**.

Necessarily a punched tape record of the modified protected rungs **must** be made after the End of Protected Logic rung is re-entered. The tape is then returned to Allen-Bradley, along with the Module, for "burning-in" of the read-only memory on the Protected Logic Module.

8.0 Status Area — With the introduction of the Series B version, the Program Panel Interface Module requires that 9 words **must** be reserved at the end of the memory. These form a Status Area which **may not** be otherwise used since the Processor (with Cat. No. 1774-LP3, -RP3, and -RP4 only) performs certain checks in this Status Area.

The Status Area is absolutely required for proper functioning of On-Line Data Change, Bit Manipulation and Remote Mode Selection features. Should an attempt be made to use the last 9 words of memory from a Program Panel, a Digital Cassette Recorder, a punched tape reader, or other peripheral device, the Series B Module rejects the attempt. Should the Program Panel be connected during this time, the message MEMORY END ERROR is displayed to warn the user of this condition. (The Series B Data Handling Module, Cat. No. 1774-DH2, if available, can be used to display the total number of words used in memory, thereby gaining a more definite interpretation of the condition.)

1 Refer to Publication 1774-814, Figure 5, Rungs No. 1 and 4. Specific programming of this type at the beginning of the program causes the Module to prevent any editing. The compatibility of this feature extends downwards to the earlier Cat. No. 1774-DL Module.

In instances where a Series B Module is placed in a Processor with Cat. No. 1774-LP3, -RP3, -RP4 (which implies a Chassis with Cat. No. 1774-LA2), yet any of the 9 words may be incorrectly used, moving the Interlock Bar to the ON (down) position causes the ERROR indicator on the Module to illuminate. (Refer to Paragraph 1.2.) Additionally, if the Processor is operating in the RUN/PROGRAM LOAD mode, those functions which normally operate in this mode are inhibited, and outputs controlled by the Bulletin 1774 PLC are disabled. Outputs are also disabled if the Processor is operating in the RUN-MONITOR mode when the attempted load is made.

The PROGRAM LOAD and TEST-MONITOR modes continue to function normally under these circumstances.

In order to recover from this condition, one of the following actions may be taken by a user:

- Remove at least 9 program Instructions, perhaps by eliminating redundant logic.
- Abbreviate some of the Messages stored as Data Handling Reports. Do this by removing individual characters. (Remember: 2 characters equal 1 word.)
- Add another Memory Module, if possible, to "create" the 9-word Status Area.
- Change a Fixed 45-word Data File format, if used, to the Variable Length format in order to conserve required words. Also consolidate two 45-word Data Files that are only partially filled. (This action assumes a **Series B** Data Handling Module having Cat. No. 1774-DH2.)
- Use the **Series A** Program Panel Interface Module (Cat. No. 1774-TB2), if available.
- Eliminate the 9-word Status Area by sacrificing the RUN/PROGRAM LOAD functions. Do this by cutting the Jumper.

CAUTION: The Remote Mode Jumper should only be removed if other methods, described immediately above, are unsatisfactory. Understand that once the Remote Mode Jumper is removed many of the new features do not operate.

When a Series B Module is used in a Processor with Cat. No. 1774-LP1, -LP2, -RP1 or -RP2 (which implies a Chassis with Cat. No. 1774-LA) there is **no** 9-word requirement. (An automatic sensing circuit disables the function.) Note, however, that RUN/PROGRAM LOAD mode functions do not operate in these Processors; their Mode Select Switches do not have the RUN/PROGRAM LOAD position. Also not all Series B features operate. (Refer to Table M.)

In instances where users do not intend to utilize the features Bit Manipulation, Remote Mode Selection and On-Line Data Change in Processors having Cat. No. 1774-LP3, -RP3, -RP4, and may be using programs developed without the 9-word requirement, the automatic Status Area search performed by the Module, and the consequent output-disabling function, may be optionally removed by the user. (Note that removing the Remote Mode Jumper has **no** effect on other Mode Select Switch positions.) After such modification, the RUN/PROGRAM LOAD mode operates in the same manner as the RUN-MONITOR mode—as with the Series A Module.

Detailed explanations of the Status Area's functions are given in other publications where they apply.

9.0 Remote Mode Jumper — The Remote Mode Jumper has been provided on the Program Panel Interface Module's (Cat. No. 1774-TB2) circuit board. Removal of the Jumper disables **all** RUN/PROGRAM LOAD operations in Processors having the Cat. No. 1774-LA2 Chassis. Functions which no longer operate include:

- Mode Selection
- Bit Manipulation, Monitoring
- On-Line Data Change

Table M
PROGRAM PANEL INTERFACE MODULE FEATURES

FEATURE	Cat. No. 1774-TB2		FEATURE OPERATES IN PROCESSORS HAVING Cat. No. 1774-LA CHASSIS?
	Series B?	Series A?	
Multiple Rung Display	Yes	No	Yes
Rung Scrolling	Yes	No	Yes
Baud Rate Selection	Yes	No	Yes
On-Line Data Change	Yes	No	No
Remote Mode Selection (from Program Panel Keyboard)	Yes	No	No
Bit Manipulation	Yes	No	Monitor only
Hardcopy Contact Histogram	Yes	No	Yes
Element Search (No Address Needed)	Yes	No	Yes
New Examine ON, Examine OFF, CRT Element Format	Yes	Yes	Yes
Faster CRT Updates than Cat. No. 1774-TB Module	Yes	Yes	Yes
Full 12K Memory Access	Yes	Yes	No
Full 1024 Data Table Access	Yes	Yes	No
[SEARCH] [RUNG ↑] for START of Program	Yes	Yes	Yes
[SEARCH] [RUNG ↓] for END (of program)	Yes	Yes	Yes
Data Change (off-line)	Yes	Yes	Yes

After removal of the Jumper, the 9-word Status Area may then be used for program Instructions, Data Handling Files and Messages.

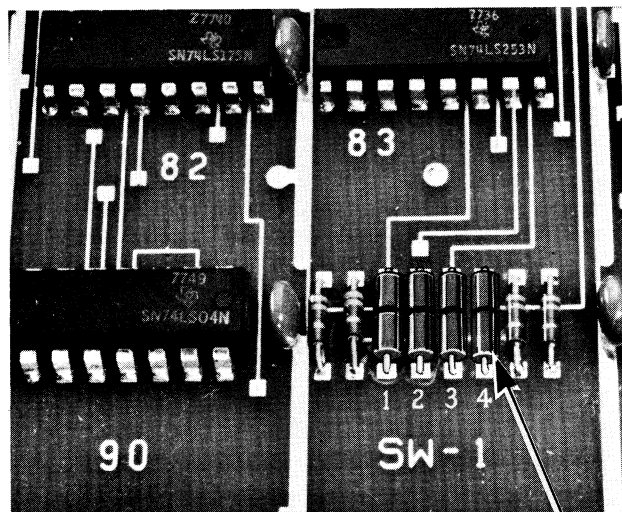
The Remote Mode Jumper is to be removed in the following manner:

- Step 1 — Place the Module on a flat surface so that the white identification sticker on the edge of the metal cover faces up.
- Step 2 — Remove the 6 Phillips screws that secure the metal cover to the Module.
- Step 3 — Remove the metal cover. The Remote Mode Jumper can then be seen. (Refer to Figure 8.)
- Step 4 — Locate the lettering SW1 at the lower center area of the printed circuit board. The Remote Mode Jumper is the component above the digit 4.
- Step 5 — Using a small pair of diagonal cutters, clip both leads of the jumper.

CAUTION: Under **no** circumstances should a soldering tool be used when removing this Jumper. Damage to the printed circuit board or to adjacent components could occur.

- Step 6 — Replace the metal cover so that the white identification label is near the 41-pin connector.
- Step 7 — Replace the Phillips screws.
- Step 8 — Affix a label to the metal cover which states **REMOTE MODE JUMPER REMOVED**. This label will be an aid in Module identification and troubleshooting.

10.0 Series A Module — As stated in the Introduction, the Series B Program Panel Interface Module incorporates the features of the Series A Program Panel Interface Module. These common features include:



Remote Mode Jumper

IN PLACE - Status Area Functions
(Reserve 9 words.)

REMOVED - Status Area Removed
(Do not reserve 9 words.)

Figure 8 — Remote Mode Jumper

- New Examine ON, —] [—, and Examine OFF, —] / [—, CRT Instruction format.
- Faster update of the Program Panel CRT display than possible with the Cat. No. 1774-TB Module.
- Full access to the 1024 Data Table and three Memory Modules (12K).

Table N

SUPPORTING DOCUMENTATION

TITLE	PUBLICATION NUMBER	
	Product Data Sheets	Manuals
PLC Processor (Cat. No. 1774-LP3, -RP3, -RP4)	1774-900	—
PLC Memory Organization and Structure	1774-934	—
PLC Program Panel (Cat. No. 1774-TA, -TH)	1774-939	—
Direct Data Terminal Cable (Cat. No. 1774-TG)	1774-920	—
Program Panel Interconnect Cable (Cat. No. 1774-TC)	1774-941	—
Protected Logic Module (Cat. No. 1774-DL2, Series B)	1774-942	1774-814
User's Guide, Digital Cassette Recorder (Cat. No. 1770-SA)	1770-900	1770-800
User's Manual, Peripheral Data Terminals	—	1774-809

- Several new search and edit functions, such as:
 - Using two simple key-strokes to search for either the starting rung or END (of program) Instruction of the user's PLC program.
 - Directly inserting new Timer and/or Counter Preset and Accumulated Values with the Mode Select Switch in the PROGRAM LOAD position.
 - Inserting new values into words addressed by Data Manipulation Instructions with the Mode Select Switch in the PROGRAM LOAD position.

A listing of features for the Series A and B Program Panel Interface Module is given in Table M.)

11.0 Supporting Documentation — This document assumes that the reader is familiar with all operating procedures for the Bulletin 1774 PLC programmable controller, including the operation of the controller with the Digital Cassette Recorder or with recommended RS-232-C compatible peripheral devices. Should the reader want to review this material, Table N lists applicable Publication Numbers. Copies of these documents can be obtained from your local Allen-Bradley representative.

COMPATIBILITY/APPLICATION NOTES

1. For convenience, the Series B Cat. No. 1774-TB2 Program Panel Interface Module may remain installed in Processor Slot No. 0 even though it is not actually being used. It is a good practice to disconnect the Program Panel Interconnect Cable to guard against inadvertent or unauthorized changes to the user program.
2. Cables, as specified in Table A, can be connected to or disconnected from the Cat. No. 1774-TB2 Module front connector **without** removing the AC power from either the PLC controller or the communicating device.
3. Certain enhanced features of the **Series B** Cat. No. 1774-TB2 Module, such as the new display/printout format for the Examine Instructions and a faster CRT update also function if the Module is placed in Processors with Cat. No. 1774-LP1, -LP2, -RP1, -RP2. Other features, such as On-Line Data Change, are designed to function only in Processors with Cat. No. 1774-LP3, -RP3, and -RP4. Therefore, these features are **not** operational in the earlier style Processors. (Refer to Table M.)
4. The Series B Cat. No. 1774-TB2 Interface Module is compatible with Series A, B, or C Program Panels (Cat. No. 1774-TA or -TH).
5. The Cat. No. 1774-TB2 (Series B or A) Module must be used during program entry if the user application program is to **fully** utilize the features of the Arithmetic Module (Cat. No. 1774-LD2). Series B and C Program Panels are capable of Arithmetic Instruction entry.
6. Only the Cat. No. 1774-TB2 (Series B or A) Module can access the entire 1024 Data Table and the third (optional) Memory Module in the enhanced Processor. Keyed Processor connectors guard against insertion of Cat. No. 1774-TB Modules into enhanced Processors (Cat. No. 1774-LP3, -RP3, -RP4).

7. When the **Series B** Program Panel Interface Module (Cat. No. 1774-TB2) is used in Cat. No. 1774-LP1, -LP2, -RP1, -RP2 Processors, the Module does not require that 9 words be reserved at the end of the Memory. When placed in these Processors, the Module does not perform functions which are carried out in the RUN/PROGRAM LOAD mode.
8. Although the user may choose to remove the Remote Mode Jumper, thereby removing the 9-word Status Area requirement of the Program Panel Interface Module, certain other modules used in the same Chassis (Cat. No. 1774-LA2) **do require** that these 9 words be reserved. Table O lists all Modules that require the 9-word Status Area.

Therefore, it is recommended that the user not use the last 9 words in memory for program Instructions, Data Files or Messages if **any** of the Modules in slots 0 thru 3 are Series B, or later.

9. Updating of the **Series A** Program Panel Interface Module (Cat. No. 1774-TB2) to the **Series B** level at the user's site or at the factory is optionally available. Field update is assigned Cat. No. 1774-UB2. Factory update is assigned Cat. No. 1774-UB1. Publication SD42 lists price and procedures.
10. When the Contact Histogram feature is being used for extended periods of time, it is recommended that the screen be dimmed by adjusting the intensity control on the front of the Program Panel. It is possible that a brightly illuminated display could be "burnt into" the phosphorus coating inside the CRT screen, thereby obscuring subsequent displays.
11. Frequently, Modules thought to be malfunctioning are capable of functioning normally, except that front-edge connector pin(s) are not making proper contact. Check pin orientation and alignment as a first troubleshooting check.

CAUTION: When mating the 41-pin connector from any of the cables listed in Table A, align the connectors **carefully**. Press together **gently**. Carelessness can cause a misalignment that prevents proper operation.

Table O
MODULES REQUIRING STATUS AREA

MODULE	Cat. No.	SERIES 1
Program Panel Interface	1774-TB2	B
On-Line Programming	1774-TL2	— 2
Computer Interface	1774-CI2	C 2
Data Handling	1774-DH2	B
Protected Logic	1774-DL2	B

1 Series B and later Modules will have the 9 word restriction.

2 This Module is not, as of the publication date, available.

NOTES

NOTES



ALLEN-BRADLEY
Cleveland, Ohio 44143



P/N 635263-50